Setting the Stage To Screen Biocontrol Fungi

For agricultural researchers, the clock is ticking. They must find a replacement for methyl bromide, or leave America's growers helpless against a horde of agricultural pests and food pathogens. Methyl bromide—now used to protect more than 100 crops from an array of pests and pathogens—will be phased out by January 1, 2001.

A variety of new tools—both chemical and nonchemical—will be needed to find alternatives for methyl bromide, now the only pesticide and soil fumigant used to control several pests. Biological agents will play an important role.

ARS scientists in Beltsville, Maryland, have discovered three new species of beneficial fungi that may have the potential to fill part of the gap left by the phaseout of methyl bromide.

Mycologist Gary J. Samuels identified and described the new fungi. Amy Y. Rossman, who leads the ARS Systematic Botany and Mycology Laboratory, says, "All three of Samuels' new fungi belong to the genus *Hypomyces*. That makes them cousins of known beneficial fungi in a related genus—*Trichoderma*.

"Since *Trichoderma* attacks other fungi, these newly discovered relatives also hold promise as biocontrol agents," says Rossman.

Samuels is a world expert on *Trichoderma.* "The problem," he says, "is that these newly described fungi reproduce primarily asexually, so they can't be readily improved by sexual reproduction to fight crop diseases."

Samuels' job at the Beltsville lab is to describe and catalog new species of fungi. His systematic taxonomic work lays the foundation for other scientists seeking to develop biological agents that combat crop-destroying fungi or produce useful secondary metabolites, such as chitinase enzymes.

Samuels' work is cut out for him. "Many organisms important to agriculture are still undescribed or relatively unknown," he says. "Many are new species—previously unknown to science."

Most mycologists agree that the estimated number of fungal species is around 1.5 million. Only about 10 percent have been scientifically described.

Samuels, working with Kadri Poldmaa of the Institute of Botany and Zoology at the University of Tartu in Estonia, discovered one of the new species of *Hypomyces* in Illinois.

"It often happens that these fungi occur in nature as the asexually sporulating form, *Cladobotryum,* in the absence of their sexual state, *Hypomyces.* Both forms are given names.

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In his Beltsville laboratory, microbiologist Gary Samuels examines various species of *Trichoderma* fungi collected from Belgium and the United States.

Such is the case of the asexual state of the new species, *Hypomyces viridigriseus,*" says Samuels. The fungus' asexual form, *C. viridigriseum,* was first found in Ontario, Canada, in 1988.

It was not seen again until Samuels and Poldmaa were collecting fungi in Illinois in 1996. There they found *C. viridigriseum* growing on an old fungus in association with the *Hypomyces* state that they determined to be an undescribed species.

The other two newly described species, *H. favoli* and *H. puertoricensis,* were discovered on rotting wood by USDA Forest Service scientist D. Jean Lodge in 1992 while conducting a biological survey of the rainforest in Puerto Rico.

Samuels and Poldmaa were able to take a sexually produced spore from each of these fungi, grow them in pure culture, and produce the asexually sporulating state of each new *Hyplomyces.*

But it is the sexually reproducing forms of these new fungi that have researchers excited about their potential as biocontrol agents to replace methyl bromide. "Discovering a species of *Hypomyces* in its sexual state is important, because then the fungus can be genetically manipulated and improved to fight harmful fungi," says Rossman.

Several ARS laboratories are searching for biological alternatives to methyl bromide for controlling fungal disease.—By **Hank Becker,** ARS.

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